UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 10/765,013 | 01/26/2004 | William H. Ackerman III | 12500.V2015A | 1289 |

7590 10/02/2007

SPECKMAN LAW GROUP PLLC
Suite 330
1201 Third Avenue
Seattle, WA 98101

| EXAMINER | |
|---|---|
| JAWORSKI, FRANCIS J | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 3768 | |

| MAIL DATE | DELIVERY MODE |
|---|---|
| 10/02/2007 | PAPER |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/765,013 | ACKERMAN, WILLIAM H. | |
| | Examiner | Art Unit | |
| | Jaworski Francis J. | 3768 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *15 August 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1 - 13* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1 - 13* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102/103*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1 – 13 as amended or newly presented are rejected under 35 U.S.C. 102(e) as being anticipated by Dodd (US5833614), under two interpretations:

a) Dodd (US5833614) is directed method and structure for suppressing transmission of harmonics by modulating the pulse width and number of pulses in a given transmission channel carrier pulse burst and therefore the energy in order to reduce harmonic content with apodization being practiced by amplitude tapering between elements across the linear array, see cols. 5 – 6 bridging, and the the examiner is concurring with the applicant that Dodd et al does not teach or suggest

varying pulse width while keeping pulse amplitude constant between transducer elements across the array. However Dodd is nonetheless anticipatory of the literal current wording of the base claim under the clarifiers inserted by the examiner:

Dodd teaches a method for transmitting a short series of pulses of ultrasonic energy which would be termed the carrier burst that in an imaging context would be the firing for the pulse echo scanline, and would produce a series of such bursts in the course of sweeping the scanlines for obtaining an image frame, and *temporally* modulates the amount of energy being transmitted in each burst from each transducer array element that contributes to the firing, by varying the width of each energy pulse (instead of varying pulse amplitude by the traditional temporal (gaussian) amplitude modulation 82, and in order to approximate the energy scaling of same) while keeping each pulse amplitude constant from pulse to pulse within a so-defined burst and between such bursts, all in the temporal not spatial sense, for each transducer element across the probe, in order to reduce the harmonic content of the modulated energy.

[ This first argument may be re-stated for clarification as follows: Since the base claim does not assign any specificity such as cross-array apodization energy taper to the manner in which harmonic content is reduced, Dodd is applicable under a first interpretation in which the traditional Gaussian or other temporal amplitude modulation which is the envelope to the RF carrier burst that serves as the imaging ensonation pulse and which time-taper traditionally served to reduce harmonic content in conventional imaging of the fundamental (since one doesn't want to get back energy outside of the echo bandpass in fundamental imaging), this has been replaced by an

analogous pulse width taper for harmonic imaging (since while in harmonic imaging one indeed now wishes to image a harmonic return for its higher lateral resolution and so has set the receive bandpass thereto, in the two variants of such imaging the harmonic image in the *tissue harmonic case* is a built-up effect of phase advance on the positive peak of the carrier and phase retardation on the negative peak due to the dependency of wave velocity of the compression waves of their own transient compression of tissue, and in the *contrast agent harmonic* case is a point source effect in the vasculature of a compression wave on a high reflectivity microbubble inducing the harmonic as its resonance, the net being that the same problem faces the 'harmonical-ist' and the 'fundamental-ist' imager – don't leak harmonic energy forward with the transmission.

In the course therefore of practicing harmonic suppression Dodd et al practices temporal burst tapering for all array elements, which under the above reading is semantically readable against the literal claims wording.]

b) Dodd et al is also applicable under a second argument. That is, while the first argument supra is predicated on the fact that apodization which is an amplitude taper applied across an array in order to reduce sidelobe misdirection of energy is irrelevant to the semantic nature of that rejection, Dodd et al also propose that in one variant that apodization taper can be unused in favor of uniform cross-array apodization function simplification, per col. 4 lines 59 – 65. In this case then the above reading of rejection a) would be amended in relation to the last three lines of claim 1 as:

...while keeping each pulse amplitude constant from pulse to pulse within a burst or between temporal successions of such pulse bursts as well as spatially across the array face (by the default to single-amplitude or non-apodization) with the overall modulation being sufficient to produce reduction in forward leakage of harmonics that would contaminate returning echoes of either the tissue or contrast agent harmonic imaging modes. –

[ Alternately stated, a second semantic conflict with the base claim wording presents here, since the wording reads against temporal pulse width modulation as a harmonic suppression technique without use of cross-array shading.]

Claims 2 – 4 , 6 – 7 and 10 – 12 are rejectable only under argument a) since only that variant of reading involves an apodization shading in place across the aperture which tapers the energy towards the array edges.

Dodd suggests the use of digital logic and control devices for the transmit waveform generation stage.

Claims 1 -13 as amended or newly presented are rejected under 35 U.S.C. 102(e) as anticipated by Haider, of record.

Haider, in and of itself teaches method of use and structure for an ultrasound system concerned with the equivalence of pulse width modulation of the entirety of pulses within a burst from a given transducer element with respect to other bursts from all other such elements that contribute to the linear array's directed firing, and

therefore its fig. 3 righthand side showing energy diminution towards the array edges meets the claims save for the final recitation clause of the modulation's purpose. While Haider is not directed to harmonic suppression but merely to generically teaching how to use pulse width modulation as an energy taper across an array face as an equivalent to the pulse amplitude modulation as such an energy taper, and concerns with harmonics in the col. 5 discussion only insofar as to describe how to engineer the width modulation taper in consideration of where the overall transmission energy lies bandwise, Haider nonetheless notes that the systems in which he is dealing act intrinsically to suppress higher order harmonics by the array element (filtering) effects on the transduction of the square wave pulses of the ensonating burst, see col. 2 lines 12 – 17 and col. 5 lines 25 – 31, and therefore Haider's modulating effect when applied to conventional transducers is sufficient to produce reduction in higher order harmonics.

Haider otherwise uses a digital transmit sequence memory.

Bradley et al (US6117082) teaches in cols. 11 – 12 bridging that in order to emphasize the subharmonic in the return echo one may temporally combine a fractional seed harmonic with a fundamental waveform, where in the embodiment where these two component portions are separately generated, the pulse duration may be made to vary between these temporally successive portions. However there is no indication that any cross-array or between element pulse duration variation occurs as opposed to conventional amplitude apodization.

Russell (US4841492) in the context of discussion of apodization by cross-array amplitude tapering and/or by electrode geometry (per col. 3 discussion) in order to achieve an apodized energy profile across the array mentions in passing col. 12 lines 24 – 34 in wholly ambiguous fashion that either a fixed pulse number across the array need be followed or the particular circuit for generating a pulse number need not be followed (?), and therefore this is considered insufficient to teach an artisan anything about method or structure for using pulse width modulation in order to reduce harmonics in a modulated signal.

This action is NOT made final however the case should be prepared for final action.

Any inquiry concerning this communication should be directed to Jaworski Francis J. at telephone number 571-272-4738.

FJJ:fjj

092407

Francis J. Jaworski
Primary Examiner